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(54) Filter assembly for vacuum cleaner

(57) In a vacuum cleaner comprising a motor or fan unit 10 for causing air to flow along an airflow path 18 and first and second filters 12, 14 arranged respectively upstream and downstream of the motor or fan unit, the first and second filters are connected together eg by a rigid or resilient member 16 so as to form a single filter assembly. The filters are preferably electrostatic filters and the main dust collection means of the cleaner is preferably a cyclone device. This arrangement of the filters encourages the user regularly to maintain both filters, thus improving the performance of the vacuum cleaner. In one embodiment (Fig. 3), the arrangement is such that, when in use the dirt and dust collecting means are made accessible or removed for emptying or replacement, both filters (112, 114) are visible to the user.

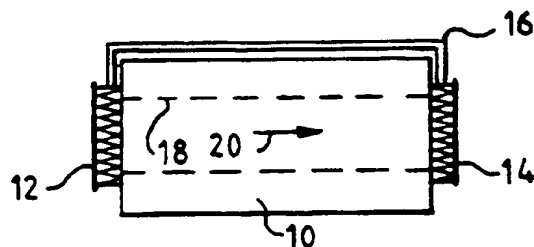


FIG. 1

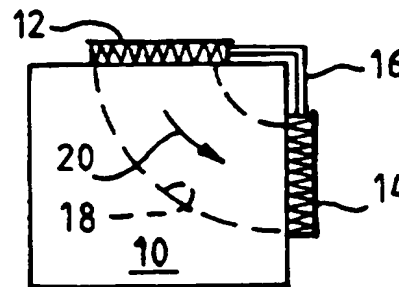
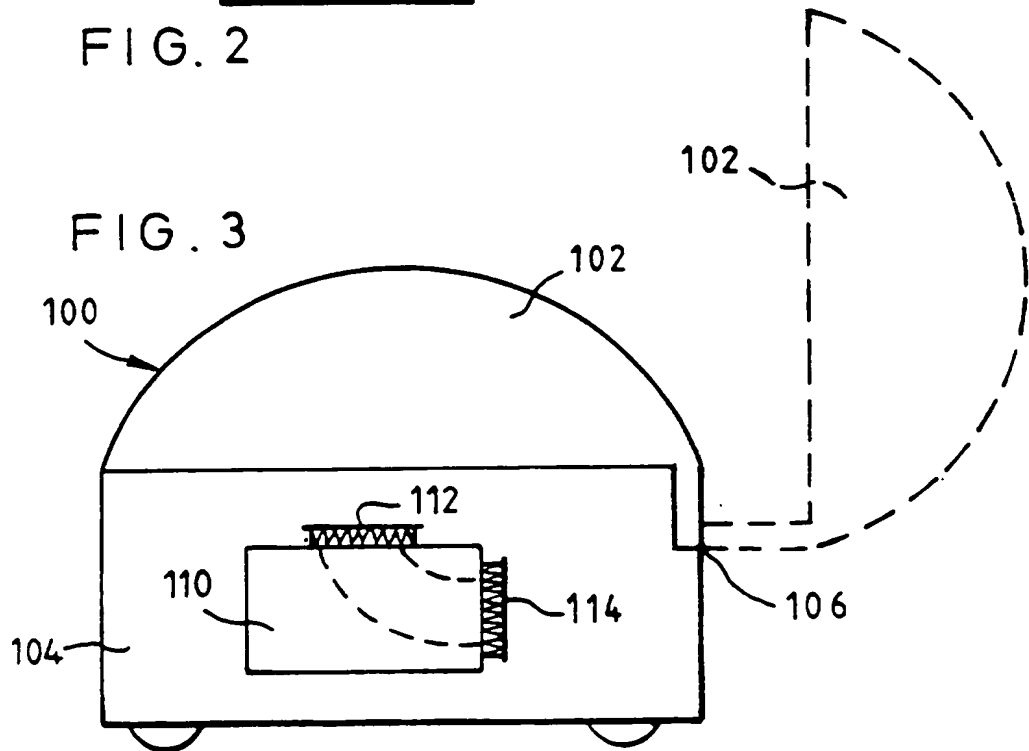
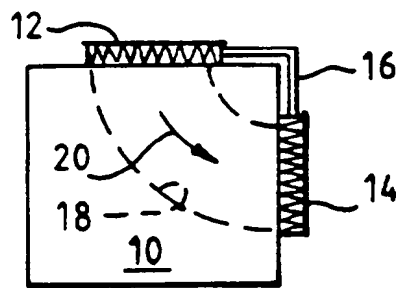
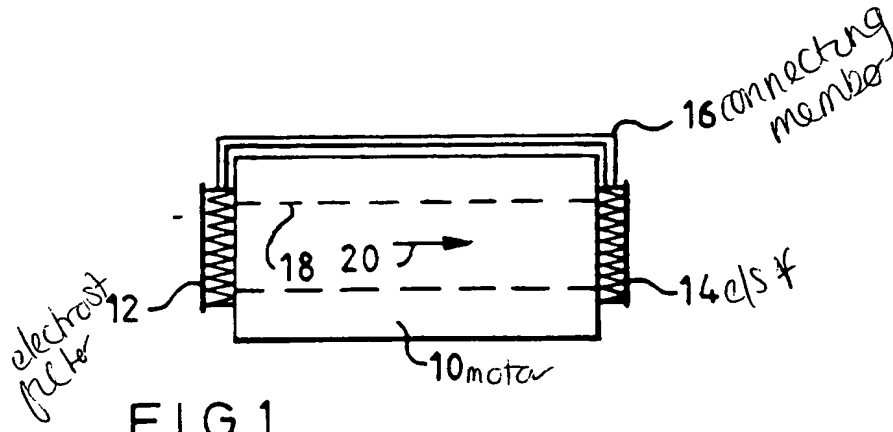


FIG. 2



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A VACUUM CLEANER AND A FILTER ASSEMBLY THEREFOR

The invention relates to a vacuum cleaner and to a filter assembly therefor. It will be understood that the term "vacuum cleaner" is here used so as to encompass any type of cleaning apparatus which uses the creation of a vacuum to draw air along an airflow path.

Vacuum cleaners of both the upright and cylinder types operate by utilising a motor or fan unit to draw air along an airflow path from a dirty air inlet to a clean air outlet via some sort of filtering or dirt/dust separating apparatus. The air which passes along the airflow path thus passes through the motor or fan unit.

It is known to filter the air passing along the airflow path before it is expelled to the atmosphere. If the appropriate filter is located upstream of the motor or fan unit, any particles of dirt, carbon, etc becoming entrained within the airflow inside the motor or fan unit will inevitably be expelled into the atmosphere with the airflow. If the filter is located downstream of the motor or fan unit, any dirt or dust remaining in the airflow after it has passed through the filtering or dirt/dust separating apparatus will pass through the motor or fan unit. This may cause the motor

or fan unit to become unbalanced which will shorten its life and may result in premature failure. Also, dust can collect and build up in the region of the motor or fan unit which can result in sudden unwanted releases of large quantities of fine dust which can cause blockage of the filter or damage the motor or fan unit.

A very few manufacturers have, prior to the date of this application, been fitting electrostatic filters both before and after the motor or fan unit. This has the advantage of preventing dusty air from passing through the motor or fan unit and also of preventing any particles released within the motor or fan unit from escaping into the atmosphere. However, two problems have been identified in respect of this arrangement. Firstly, even if the operator remembers to change one of the filters, the second filter is rarely changed. Presumably this is because changing the first filter gives the operator sufficiently improved performance for the changing of the second filter to be thought unnecessary or else the second filter is forgotten. Secondly, the operator has difficulty in ascertaining that the filters require changing because they are not easily visible.

It is an object of the present invention to provide a vacuum cleaner having filters arranged both before and after the motor or fan unit which is easy and convenient to operate and to maintain. It is a further object of

the invention to provide a filter assembly for use in such a vacuum cleaner.

The invention provides a vacuum cleaner as claimed in claim 1 and also a filter assembly as claimed in claim 8. A vacuum cleaner as claimed in claim 13 is also provided. Advantageous features are set out in the subsidiary claims.

Embodiments of the invention will now be described with reference to the accompanying drawings wherein:

Figures 1 and 2 each show schematic side views of a motor or fan unit forming part of a vacuum cleaner according to a first aspect of the present invention; and

Figure 3 shows a vacuum cleaner arranged in accordance with a second aspect of the invention.

Each of Figures 1 and 2 shows, in schematic side view, a motor or fan unit 10 having an airflow path 18 passing therethrough. The direction of airflow is shown by arrows 20. Each motor or fan unit is of conventional design and manufacture and will not be described further here.

Immediately upstream of the motor 10 and covering the entry of the airflow path 18 into the motor 10 is an electrostatic filter 12. A second electrostatic filter 14 is located immediately downstream of the motor 10 in the airflow path 18. A connecting member 16 extends between the filters 12, 14 thus forming a connection therebetween.

The electrostatic filters 12, 14 are of standard design and manufacture. However, it will be understood that alternative types of filter suitable for use in vacuum cleaners can be utilised. The connecting member 16 can be rigid or non-rigid and can be formed, if desired, from a single piece of material, e.g. a plastics material, or can be manufactured from a plurality of separate parts. A resilient or hinged construction is preferable for ease of packaging, storage and transportation. The connecting member 16 may be shaped to closely conform to the shape of the outer casing of the motor 10 or may be specifically designed to provide the user of the vacuum cleaner with a gripping portion or handle so as to facilitate the removal and replacement of the filters 12, 14.

The connection between the connecting member 16 and the filters 12, 14 may be permanent or temporary. For example, in the event that a suitable filter material is used for the filters 12, 14, the connecting member 16 can also be formed from the same material to produce an integral, one-piece filter assembly. Alternatively, the connecting member 16 may be formed integrally with the filter casings, filter material being inserted into each of the filter casings. In either case, when replacement of the filters 12, 14 is required, the entire filter assembly 12, 14, 16 is discarded and replaced by a new assembly. As a further alternative, the connecting

member 16 can be of a more durable nature so that, if desired, the filters 12,14 can be removed from the connecting element 16 and replaced with new filters before the filter assembly 12,14,16 is re-fitted into the vacuum cleaner.

If the connecting member 16 is formed from the same filter material as that used to form the filters 12,14, the complete assembly may be shaped such that the portion of filter material forming the connecting member 16 is narrower than the portions forming the filters 12,14. Equally, the connecting portion need not be shaped and the whole assembly may be generally rectangular in shape so as to merely "wrap around" the motor or fan unit 10 such that the inlet and outlet of the unit 10 are overlaid by filter material.

Although not shown in Figure 1 and 2, the motor 10 is located in a vacuum cleaner so that, when the dirt/dust collection means are removed for emptying or replacement, at least part of the filter assembly 12,14,16 is clearly visible by the user. Ideally, at least one of the filters 12,14 is clearly visible in this situation. When the arrangement illustrated in Figure 2 is utilised, it is possible and advantageous for the arrangement to be such that both filters 12,14 are visible during emptying or replacement of the dirt/dust collection means. This is highly advantageous in that the user of the vacuum cleaner is reminded, each

time the dirt/dust collecting apparatus is emptied or replaced, to check that the filters do not require replacement. Easy accessibility of the filters 12,14 encourages the user of the vacuum cleaner to replace the filters 12,14 as and when necessary. Also, the presence of a connecting member 16 between the filters 12,14 means that, automatically, both filters 12,14 are removed when a check is carried out. This avoids any possibility of the more accessible filter being properly maintained whilst the less accessible filter is neglected. If either of the filters 12,14 becomes blocked, the effect on the performance of the vacuum cleaner will be adverse.

Figure 3 illustrates a second aspect of the present invention. This drawing shows a vacuum cleaner 100 having a cover 102 which is hinged to a casing 104 about an axis 106 so as to be movable between a closed position (illustrated in solid lines) and an open position (illustrated in broken lines). Inside the casing 104 are located dirt or dust collecting means (not shown) and a motor or fan unit 110. First and second filters 112,114 are located immediately upstream and downstream respectively of the motor or fan unit 110. The filters 112,114 are preferably electrostatic filters but alternative types of filter are equally suitable. Furthermore, the filters 112,114 can be connected together to form a single filter assembly if

desired.

The motor or fan unit 110 is located inside the casing 104 such that, when the cover 102 is moved from the closed position to the open position, the filters 112, 114 become visible to the user of the machine. This allows the user to see quickly and easily whether either of the filters 112, 114 requires to be replaced or cleaned. This in turn encourages the user to replace each filter 112, 114 as and when required which improves the performance of the vacuum cleaner 100.

The movement of the cover 102 from the closed position to the open position is necessary in order to provide access to the dirt and dust collecting means for emptying or replacement purposes. Thus, if a bag or bin is located inside the casing 104, the user is encouraged to look at the filters 112, 114 each time the bag or bin is emptied of dirt or dust collected by the vacuum cleaner 100. The vacuum cleaner 100 shown in Figure 3 is a cylinder-type vacuum cleaner which preferably incorporates cyclonic dirt or dust collecting means (not shown) located inside the casing 104. However, it is possible to apply the present invention to upright-type vacuum cleaners. The filters, which are unsightly, can be concealed from view when the vacuum cleaner is in normal use by a cover or panel, or else by the dirt or dust separating means themselves. When the cover or panel is removed, or the dirt or dust collecting means

is removed for emptying or replacement, both filters are rendered visible to the user.

It will be appreciated by a reader skilled in the art that the invention is not restricted to the specific embodiments described above.

CLAIMS

1. A vacuum cleaner comprising an airflow path, dirt and dust collecting means arranged in the airflow path, a motor or fan unit for causing air to flow along the airflow path and also arranged therein, a first filter arranged immediately upstream of the motor or fan unit and a second filter arranged downstream of the motor or fan unit, wherein the first and second filters are connected together so as to form a single filter assembly.
2. A vacuum cleaner as claimed in claim 1, wherein the single filter assembly is located in the vacuum cleaner so as to be visible at least in part when, in use, the dirt and dust collecting means are made accessible or removed for emptying or replacement.
3. A vacuum cleaner as claimed in claim 2, wherein the vacuum cleaner is a cylinder-type vacuum cleaner having a movable cover and the single filter assembly is made visible by opening the cover.
4. A vacuum cleaner as claimed in any one of the preceding claims, wherein the filters are electrostatic filters.

5. A vacuum cleaner as claimed in any one of the preceding claims, wherein the filters are connected by means of a rigid connecting member.

6. A vacuum cleaner as claimed in any one of claims 1 to 4, wherein the filters are connected by means of a resilient connecting member.

7. A vacuum cleaner substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

8. A filter assembly for use in a vacuum cleaner according to any one of the preceding claims, comprising a first filter for location in an airflow path upstream of a motor or fan unit and a second filter for location in the airflow path downstream of the motor or fan unit, where the first and second filters are connected together to form a single filter assembly.

9. A filter assembly as claimed in claim 8, wherein the filters are connected by means of a rigid connecting member.

10. A filter assembly as claimed in claim 8, wherein the filters are connected by means of a resilient connecting member.

11. A filter assembly as claimed in any one of claims 8 to 10, wherein the filters are electrostatic filters.

12. A filter assembly substantially as hereinbefore described with reference to the accompanying drawings.

13. A vacuum cleaner comprising an airflow path, dirt and dust collecting means arranged in the airflow path, a motor or fan unit for causing air to flow along the airflow path and also arranged therein, a first filter arranged immediately upstream of the motor or fan unit and a second filter arranged downstream of the motor or fan unit, wherein the arrangement is such that, when in use the dirt and dust collecting means are made accessible or removed for emptying or replacement, both filters are visible to the user.

14. A vacuum cleaner as claimed in claim 13, wherein the vacuum cleaner is a cylinder-type vacuum cleaner having a movable cover and both filters are made visible to the user by opening or removing the cover.

15. A vacuum cleaner as claimed in claims 13 or 14, wherein the filters are electrostatic filters.

16. A vacuum cleaner as claimed in any one of claims 13 to 15, wherein the first and second filters are

connected together so as to form a single filter assembly.

17. A vacuum cleaner substantially as hereinbefore described with reference to the embodiment shown in Figure 3 of the accompanying drawings.



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Application No: GB 9423756.7
Claims searched: 13-17

Examiner: A C Howard
Date of search: 3 March 1995

Patents Act 1977
Further Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.N): A4F (FFD, FSCA)
Int Cl (Ed.6): A47L 9/10 9/12 9/14 9/20 9/22
Other: Online: WPI, EDOC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	WO85/02100 A1 PROGRESS ELEKTROGERÄTE MAUTZ & PFEIFFER (see Fig. 1)	13, 14, 16
X	US3871847 FISH (see Fig. 2)	13, 14

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

- 14 -

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

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Relevant Technical Fields

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 (ii) Int Cl (Ed.6) A47L 9/10, 9/12, 9/14

Search Examiner
 A C HOWARD

Date of completion of Search
 3 JANUARY 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
 1 TO 6, 8 TO 11

Categories of documents

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| <p>X: Document indicating lack of novelty or of inventive step.</p> <p>- Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.</p> <p>A: Document indicating technological background and/or state of the art.</p> | <p>P: Document published on or after the declared priority date but before the filing date of the present application.</p> <p>E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.</p> <p>&: Member of the same patent family; corresponding document.</p> |
|--|---|

Category	Identity of document and relevant passages	Relevant to claim(s)
X	WO 85/02100 A1 (PROGRESS-ELEKTROGERÄTE MAUZ & PFEIFFER) see Figure 1 and the Abstract	1 to 3, 8

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).